ORAL PRESENTATION 3-2

척수재활
발표일시 및 장소 : **10 월 26 일(금) 14:15-14:25 Room D(5F)**

OP3-2-1

Cerebral Blood Flow Change after Taking Midodrine in High-level Spinal Cord Injury: A Case Series

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Objective
In high-level spinal cord injury, patients suffered from cardiovascular and autonomic dysfunctions. The orthostatic hypotension occurs as a result of systemic loss of vascular resistance, accumulation of blood within the venous system, reduced venous return to the heart, and decreased cardiac output. In previous studies, we used duplex ultrasonography to identify changes in cerebral blood flow volume (CBFV) with posture changes. The purpose of this study was to evaluate the changes of cerebral flow volume before and after administration of midodrine using duplex ultrasonography.

Materials and Methods
The internal carotid artery on right side were studied and intravascular flow volumes were measured by using a 9 MHz linear array transducer. The CBFV measurements were automatically calculated by the built-in software of the ultrasound device (Siemens ACUSON, Siemens Healthcare, Erlangen, Germany). The CBFV and blood pressure (BP) were measured in the supine position, immediately tilted 50 degrees and after 5 minutes. To increase the reliability of the test, cerebral blood flow was measured three times in each position and the mean value was used. (Figure 1) Four patients with high-level spinal cord injury were measured for CBFV before and after taking midodrine. Midodrine was administered from 10 mg to 30 mg daily depending on the improvement of symptom of patients.

Results
Three of the four patients were male and the age ranged from 21 to 64 years. The period from onset to date of examination varied from 15 days to 682 days. Only in the fourth case, the patient was taking 7.5 mg of midodrine before initial ultrasonography, and the other patients were not. The last dose of midodrine taken by patients was 10 to 30 mg, and the interval between the first and second tests ranged from 13 to 36 days. In all patients, elevated CBFV and BP were observed in the tilted state after taking the midodrine. In particular, BFV showed an increase from 5.8% (Case 3) to 50.5% (Case 4)

immediately after tilting, and increased from 1.5% (Case 4) to 32.5% (Case 2) after 5 minutes of tilting. (Table 2)

Conclusion

This study was the first to observe the change in the cerebral blood flow after using the midodrine by using duplex ultrasonography. We could confirm the increase of the cerebral blood flow objectively after taking the midodrine in patients with orthostatic hypotension.

Table 1. Overall data of four high-level spinal cord injury patients with orthostatic hypotension

	Patient 1		Patient 2		Patient 3		Patient 4	
Gender/Age	Male/53		Female/64		Male/46		Male/21	
Level of injury (ASIA impairment scale)	C4(D)		C5(C)		C6(C)		C6(A)	
Onset to exam (days)	15		58		205		682	
	Initial	Follow up	Initial	Follow up	Initial	Follow up	Initial	Follow up
Midodrine dose (mg/day)	0	10	0	30	0	25	7.5	20
Duration of initial to follow up exam (days)	22		36		13		13	
BP (systolic BP/diastolic BP, mmHg)								
Supine	100/67	97/68	114/67	119/72	110/63	118/83	126/63	135/80
Tilt 50˚ 0min	73/45	73/51	102/67	117/72	76/43	89/51	87/49	121/71
Tilt 50˚ 5min	88/68	85/67	82/55	104/69	79/48	111/72	86/50	100/65
Difference of systolic BP between supine and tilt position (mmHg)								
Tilt 50˚ 0min - Supine	-27	-24	-12	-2	-34	-29	-39	-14
Tilt 50˚ 5min - Supine	-12	-12	-32	-15	-31	-7	-40	-35
CBFV (L/min)								
Supine	0.250	0.267	0.327	0.287	0.380	0.345	0.323	0.333
Tilt 50˚ 0min	0.181	0.218	0.215	0.261	0.238	0.236	0.148	0.321
Tilt 50˚ 5min	0.186	0.251	0.193	0.234	0.191	0.233	0.292	0.306
CBFV ratio of tilt to supine position								
Supine	100%	100%	100%	100%	100%	100%	100%	100%
Tilt 50˚ 0min	72.4%	81.6%	65.7%	90.9%	62.6%	68.4%	45.8%	96.3%
Tilt 50˚ 5min	74.4%	94.0%	59.0%	81.5%	50.3%	67.5%	90.4%	91.9%

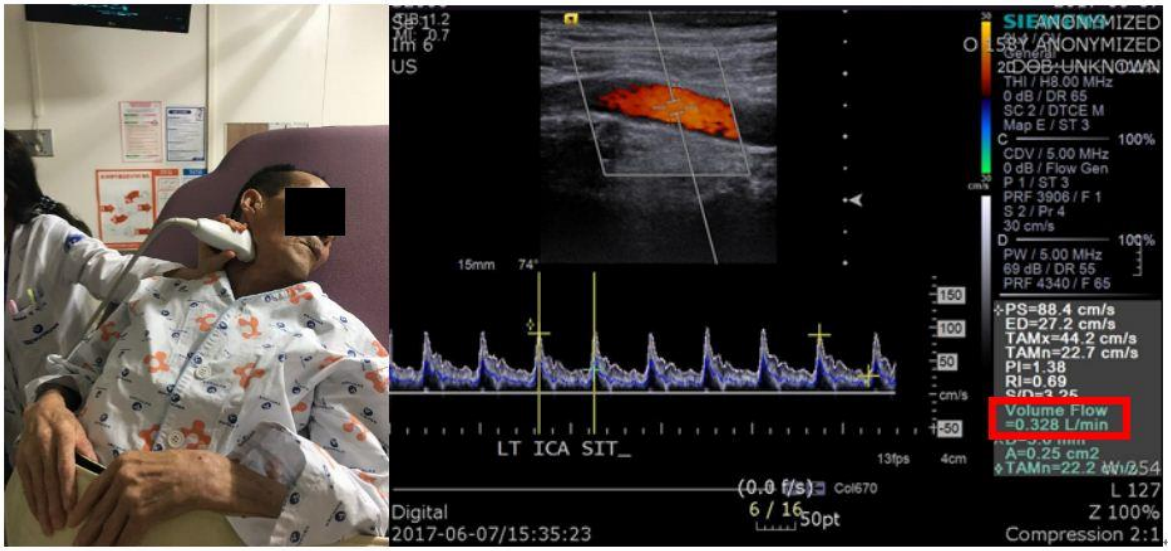

Fig 1. The position of patient and blood flow velocities measured by duplex ultrasonography